

WHAT IS CLAIMED IS:

1. A kit for DNA shuffling comprising:
  - (a) means for converting a pool of related polynucleotide sequences into overlapping fragments; and
  - (b) instructions for performing DNA shuffling.
2. A kit for DNA shuffling comprising:
  - (a) an enzyme for converting a pool of related polynucleotide sequences into overlapping fragments; and
  - (b) instructions for performing DNA shuffling.
3. The kit of claim 2, wherein the kit comprises at least one endonuclease.
4. The kit of claim 2, wherein the kit comprises at least one restriction enzyme.
5. The kit of claim 2, wherein the kit comprises at least one nuclease.
6. The kit of claim 2, wherein the kit comprises at least one DNase I.
7. The kit of claim 2, wherein the kit comprises at least one RNase.
8. The kit of claim 2, wherein the kit comprises a nucleic acid polymerase.
9. The kit of claim 8, wherein the kit comprises a DNA polymerase.
10. The kit of claim 9, wherein the kit comprises a DNA polymerase selected from the group consisting of Taq and Klenow.
11. The kit of claim 2, wherein the kit comprises a means for purifying the overlapping fragments.

12. The kit of claim 2, wherein the kit comprises a means for achieving size-based fractionation of the overlapping fragments.
13. The kit of claim 2, wherein the kit comprises one or more reagents for PCR amplification.
14. The kit of claim 2, wherein the kit comprises a pair of PCR primers.
15. The kit of claim 2, wherein the overlapping fragments are generated by random fragmentation of the pool of related polynucleotide sequences.
16. The kit of claim 2, wherein the kit comprises an expression vector.
17. The kit of claim 16, wherein the expression vector comprises a marker gene.
18. The kit of claim 16, wherein the kit further comprises a pair of PCR primers for amplifying a polynucleotide sequence residing in the expression vector.
19. The kit of claim 2, wherein the kit comprises a DNA ligase or an RNA ligase.
20. The kit of claim 2, wherein the kit comprises a thermophilic nucleic acid polymerase.
21. The kit of claim 2, wherein the kit comprises a DNA template containing a DNA base other than A, C, G or T at one or more positions.
22. The kit of claim 21, wherein the template contains one or more uracil residues.
23. The kit of claim 2, wherein the kit provides for expression of the shuffled or mutant polynucleotide.